

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
8 January 2004 (08.01.2004)

PCT

(10) International Publication Number
WO 2004/004104 A3

(51) International Patent Classification⁷: **H02M 3/156**

(74) Agent: STEENBEEK, Leonardus, J.; Philips Intellectual Property & Standards, Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL).

(21) International Application Number:
PCT/IB2003/002731

(22) International Filing Date: 12 June 2003 (12.06.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
02077553.2 27 June 2002 (27.06.2002) EP
02080112.2 5 December 2002 (05.12.2002) EP

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(71) Applicant (*for all designated States except US*): KONINKLIJKE PHILIPS ELECTRONICS N.V. [NL/NL]; Groenewoudseweg 1, NL-5621 BA Eindhoven (NL).

(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(72) Inventors; and

(75) Inventors/Applicants (*for US only*): HALBERSTADT, Johan, C. [NL/NL]; c/o Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL). DEGEN, Peter, T., J. [NL/NL]; c/o Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL). MOBERS, Antonius, M., G. [NL/NL]; c/o Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL).

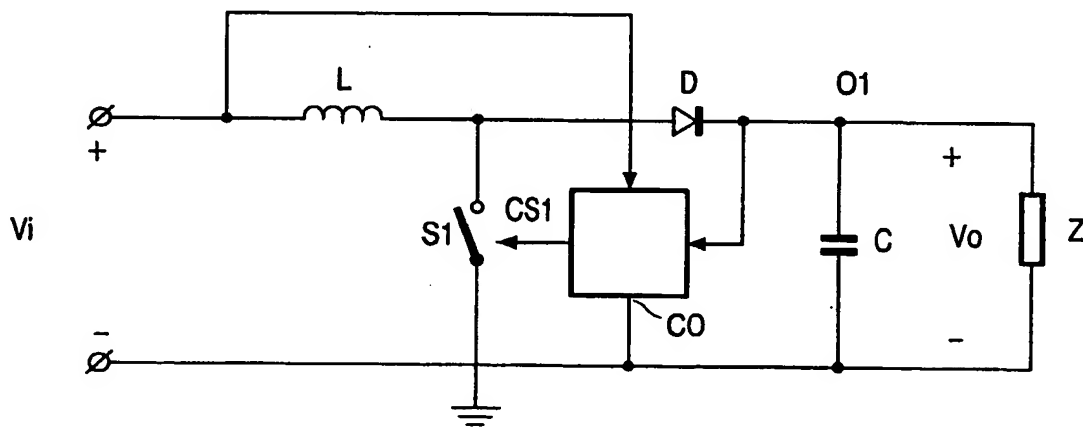
Published:

— with international search report

(88) Date of publication of the international search report:
11 March 2004

[Continued on next page]

(54) Title: DC-DC CONVERTER



(57) Abstract: A DC-DC converter comprises a switch (S1) which periodically connects an inductor (L) to a DC-input voltage (Vi) during an on-period (Ton) of a period time (Tp), an operating frequency (fo) of the DC-DC converter is the inverse of the period time (Tp). An output (O1) of the DC-DC converter is coupled to the inductor (L) to supply an output voltage (Vo). A controller (CO) controls the operating frequency (fo) of the DC-DC converter to be substantially proportional to the output voltage (Vo) to obtain a substantially constant average duration of the on-period (Ton) as function of the output voltage (Vo).

WO 2004/004104 A3



For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/IB 03/02731

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H02M3/156

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H02M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 515 257 A (ISHII) 7 May 1996 (1996-05-07)	1-5, 12-14
Y	column 1, line 1 -column 4, line 40; figures 1-4	11
Y	US 5 568 044 A (BITTNER) 22 October 1996 (1996-10-22)	11
	column 2, line 34 -column 9, line 33; figures 1-6E	
A	US 5 747 976 A (WONG ET AL) 5 May 1998 (1998-05-05)	1,2,4,7, 12-14
	column 1, line 1 -column 5, line 51; figures 1-5	



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *G* document member of the same patent family

Date of the actual completion of the international search

8 December 2003

Date of mailing of the international search report

16/12/2003

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Calarasanu, P

INTERNATIONAL SEARCH REPORT

Internat. Publication No
PCT/IB 03/02731

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
US 5515257	A	07-05-1996	JP	2767781 B2	18-06-1998
			JP	7087732 A	31-03-1995
<hr/>					
US 5568044	A	22-10-1996	DE	69526100 D1	02-05-2002
			DE	69526100 T2	25-07-2002
			EP	0783792 A1	16-07-1997
			WO	9610287 A1	04-04-1996
			US	RE37609 E1	26-03-2002
<hr/>					
US 5747976	A	05-05-1998	CN	1165992 A ,B	26-11-1997
			GB	2311629 A ,B	01-10-1997
<hr/>					